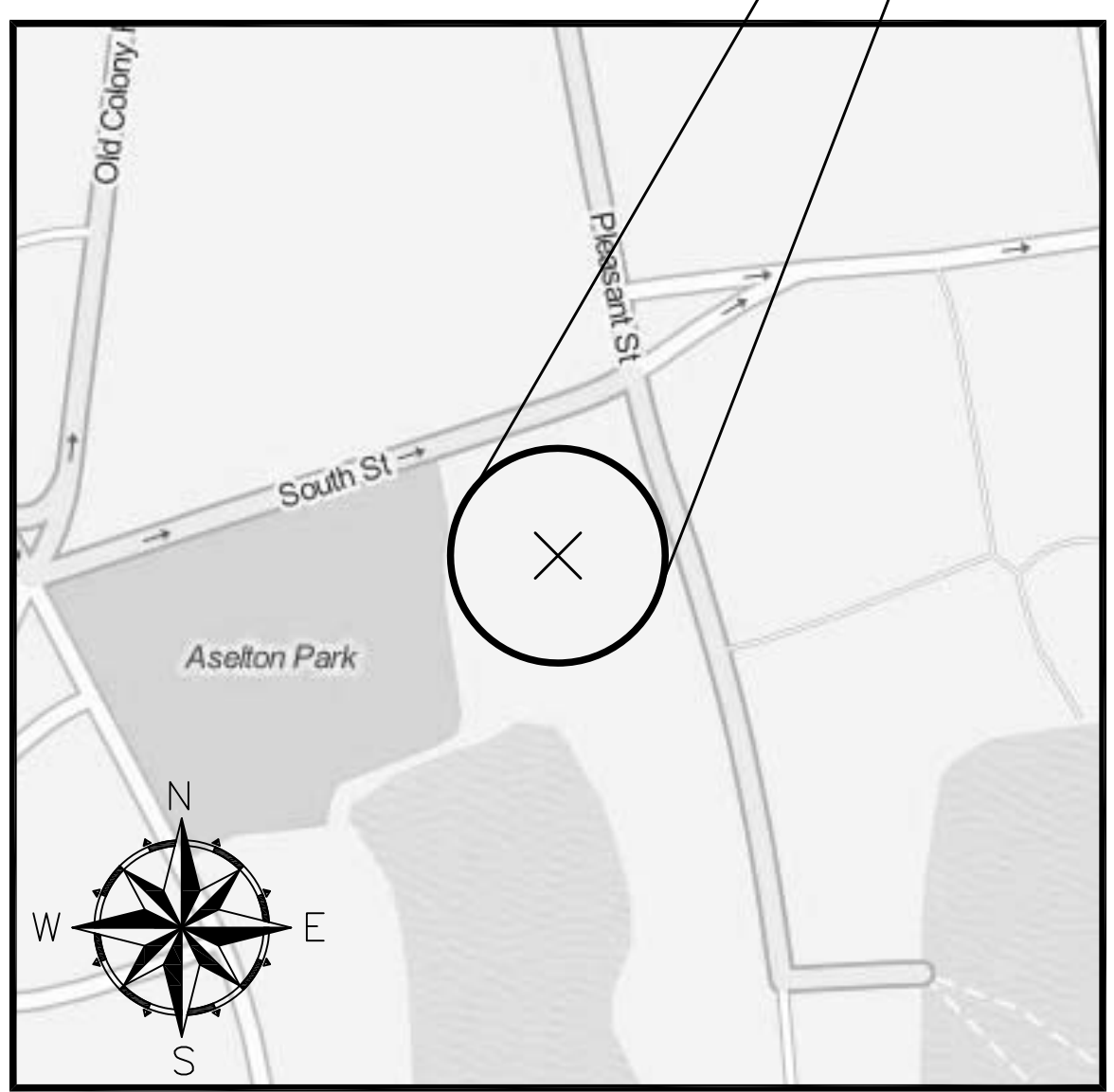
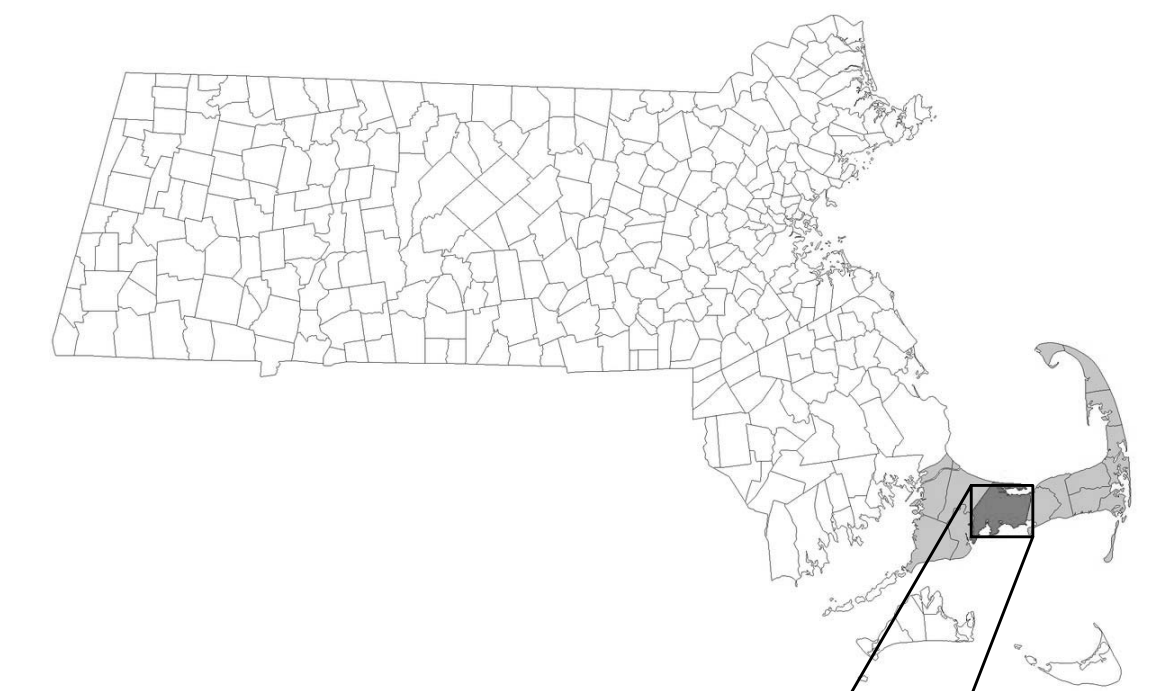


EPA Green Infrastructure Stormwater BMP Retrofit for Two Cape Cod Municipalities A Demonstration and Outreach Project


BARNSTABLE, MA
NOVEMBER 2015 - CONSTRUCTION AS-BUILTS

BARNSTABLE, MA
Gateway Marina BMP - Gravel Bioretention
Cell, South Street & Pleasant Street



BARNSTABLE PROJECT
SCALE: 1" = 200'

| <u>SHEET</u> | <u>TITLE</u> |
|--------------|------------------------------------|
| C-1 | EXISTING CONDITIONS |
| C-2 | PROPOSED CONDITIONS |
| C-3 | UTILITY PLAN |
| C-4 | LANDSCAPING AND SURFACE TREATMENTS |
| C-5 | DETAILS |
| C-6 | DETAILS |

 **EPA** United States Environmental
Protection Agency, Region 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109

 **WaterVision, LLC**
481 GREAT ROAD, SUITE 3
ACTON, MA 01720

 **COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED**
21 DEPOT STREET
MERRIMACK, NH 03054



GATEWAY MARINA BMP, BARNSTABLE – EXISTING CONDITIONS

- General Notes
1. THE LOCATION OF UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED OR INSPECTED. THE CONTRACTOR, PRIOR TO COMMENCEMENT OF CONSTRUCTION, SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT "DIG-SAFE" AT 1-888-344-7233.
 2. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION TO PREVENT ANY DAMAGE TO ADJACENT PROPERTIES. ALL AREAS WHICH ARE AFFECTED BY THE CONTRACTOR'S OPERATIONS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION OR BETTER, AT NO ADDITIONAL COST TO THE OWNER.
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 4. CONTRACTOR SHALL IMMEDIATELY REPAIR OR FILL ANY POTHoles THAT OCCUR DUE TO CONSTRUCTION.
 5. CONTRACTOR SHALL REPAIR ALL PAVING OR BRICKWORK ON SITE DAMAGED OR REMOVED DURING CONSTRUCTION.
 6. REMOVE ALL TEMPORARY EROSION CONTROLS FROM THE SITE AT THE CONCLUSION OF CONSTRUCTION ACTIVITIES.
 7. STORMWATER SHALL NOT BE DIRECTED INTO THE BASIN UNTIL ALL PLANTINGS ARE SUITABLY ESTABLISHED. CONTRACTOR SHALL EITHER TIE INTO THE EXISTING CATCH BASIN LAST OR INSTALL A REMOVAL PLUG.

| | | |
|-----|------------------------|-------|
| 5 | As-Builts | 11/15 |
| 4 | 100% Design for Const. | 04/15 |
| 3 | 90% Design | 03/15 |
| 2 | 60% Design | 02/15 |
| 1 | Conceptual | 01/15 |
| No. | Revision/Issue | Date |

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EPA Green Infrastructure
Education and Outreach Project

GATEWAY MARINA BMP,
GRAVEL BIORETENTION CELL

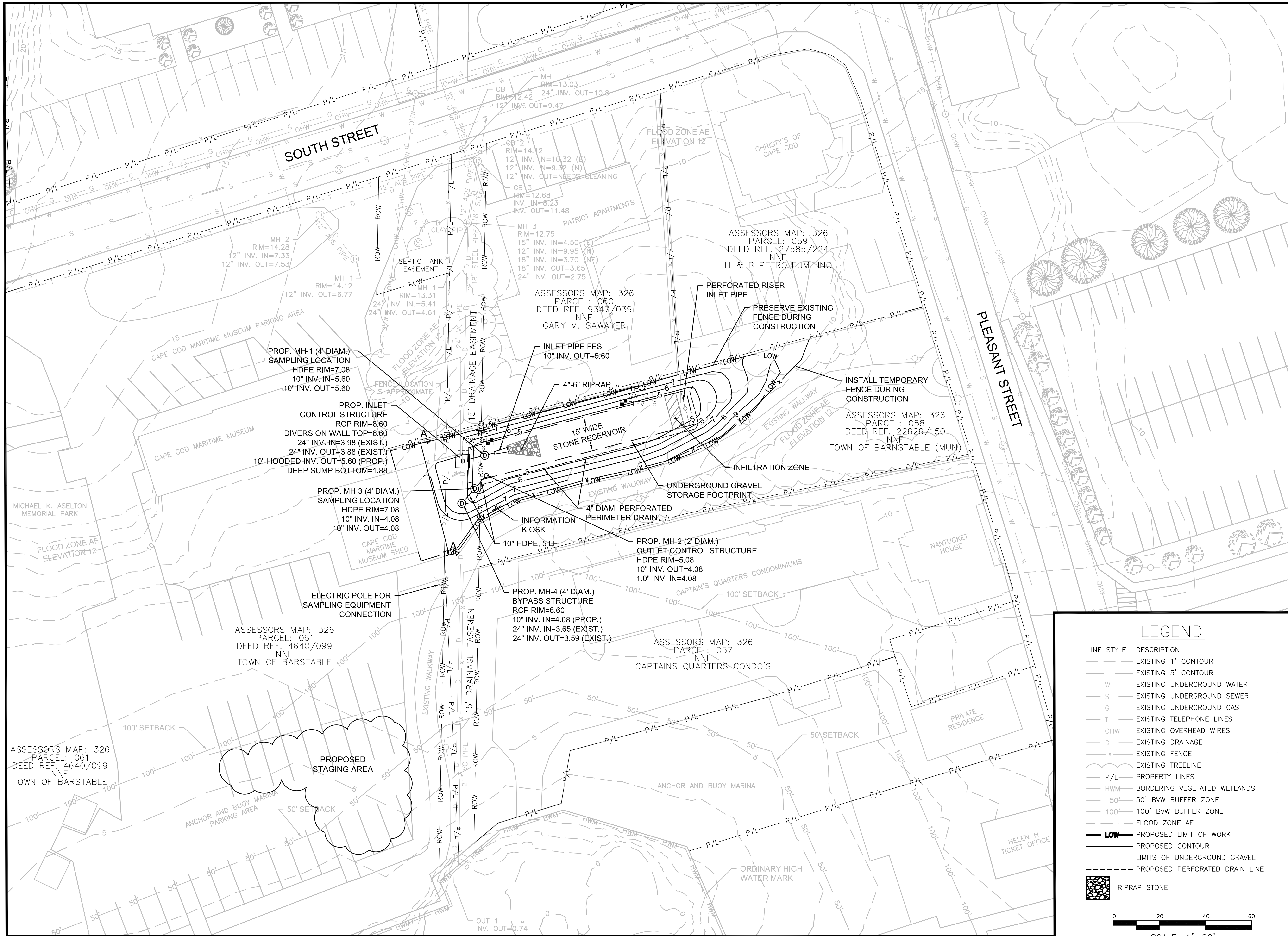
South Street and Pleasant
Street, Barnstable MA

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|---|-------|
| Project No.: 677-2 | Sheet |
| Date: NOVEMBER 2015 | C-1 |
| Drawn By: NC | |
| Checked By: ML | |
| Horizontal Datum: NAD88 Vertical Datum: NAVD88 | |

LEGEND

| LINE STYLE | DESCRIPTION |
|------------|------------------------------|
| --- | EXISTING 1' CONTOUR |
| --- | EXISTING 5' CONTOUR |
| W | EXISTING UNDERGROUND WATER |
| S | EXISTING UNDERGROUND SEWER |
| G | EXISTING UNDERGROUND GAS |
| T | EXISTING TELEPHONE LINES |
| OHW | EXISTING OVERHEAD WIRES |
| D | EXISTING DRAINAGE |
| x | EXISTING FENCE |
| P/L | PROPERTY LINES |
| HWM | BORDERING VEGETATED WETLANDS |
| 50' | 50' BWV BUFFER ZONE |
| 100' | 100' BWV BUFFER ZONE |
| --- | FLOOD ZONE AE |

SCALE: 1"=20'



GATEWAY MARINA BMP, BARNSTABLE — PROPOSED CONDITIONS

- General Notes
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| | | |
|-----|------------------------|-------|
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| 5 | As-Builts | 11/15 |
| 4 | 100% Design for Const. | 04/15 |
| 3 | 90% Design | 03/15 |
| 2 | 60% Design | 02/15 |
| 1 | Conceptual | 01/15 |
| No. | Revision/Issue | Date |

LEGEND

| LINE STYLE | DESCRIPTION |
|------------|--------------------------------|
| --- | EXISTING 1' CONTOUR |
| --- | EXISTING 5' CONTOUR |
| W | EXISTING UNDERGROUND WATER |
| S | EXISTING UNDERGROUND SEWER |
| G | EXISTING UNDERGROUND GAS |
| T | EXISTING TELEPHONE LINES |
| OHW | EXISTING OVERHEAD WIRES |
| D | EXISTING DRAINAGE |
| x | EXISTING FENCE |
| --- | EXISTING TREELINE |
| P/L | PROPERTY LINES |
| HWM | BORDERING VEGETATED WETLANDS |
| 50' | 50' BWV BUFFER ZONE |
| 100' | 100' BWV BUFFER ZONE |
| --- | FLOOD ZONE AE |
| --- | PROPOSED LIMIT OF WORK |
| --- | PROPOSED CONTOUR |
| --- | LIMITS OF UNDERGROUND GRAVEL |
| --- | PROPOSED PERFORATED DRAIN LINE |
| | RIPRAP STONE |

0 20 40 60
SCALE: 1"=20'

WaterVision, LLC
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ACTON, MA 01720

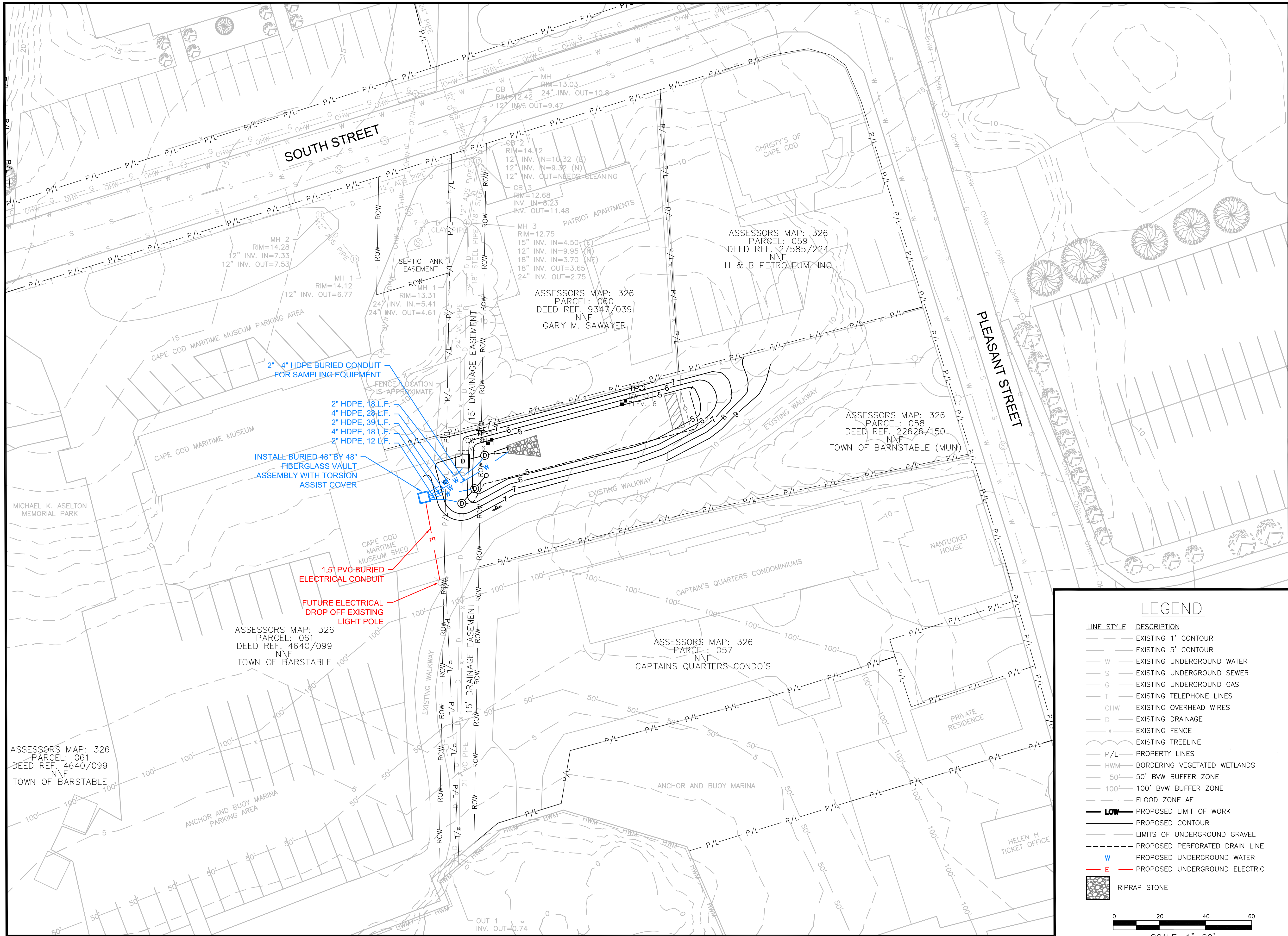
COMPREHENSIVE ENVIRONMENTAL INCORPORATED
21 DEPOT STREET
MERRIMACK, NH 03054

EPA Green Infrastructure Education and Outreach Project

GATEWAY MARINA BMP, GRAVEL BIORETENTION CELL

South Street and Pleasant Street, Barnstable MA

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|--|---------------------|
| Project No.: 677-2 Date: NOVEMBER 2015 Drawn By: NC Checked By: ML Horizontal Datum: NAD88 Vertical Datum: NAVD88 | Sheet C-2 |
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GATEWAY MARINA BMP – UTILITY PLAN

- General Notes
1. THE LOCATION OF UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED OR INSPECTED. THE CONTRACTOR, PRIOR TO COMMENCEMENT OF CONSTRUCTION, SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT "DIG-SAFE" AT 1-888-344-7233.
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| | | |
|-----|------------------------|-------|
| | | |
| 6 | As-Builts | 11/15 |
| 5 | Utility Layout | 09/15 |
| 4 | 100% Design for Const. | 04/15 |
| 3 | 90% Design | 03/15 |
| 2 | 60% Design | 02/15 |
| 1 | Conceptual | 01/15 |
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WaterVision, LLC

481 GREAT ROAD, SUITE 3
ACTON, MA 01720

COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED

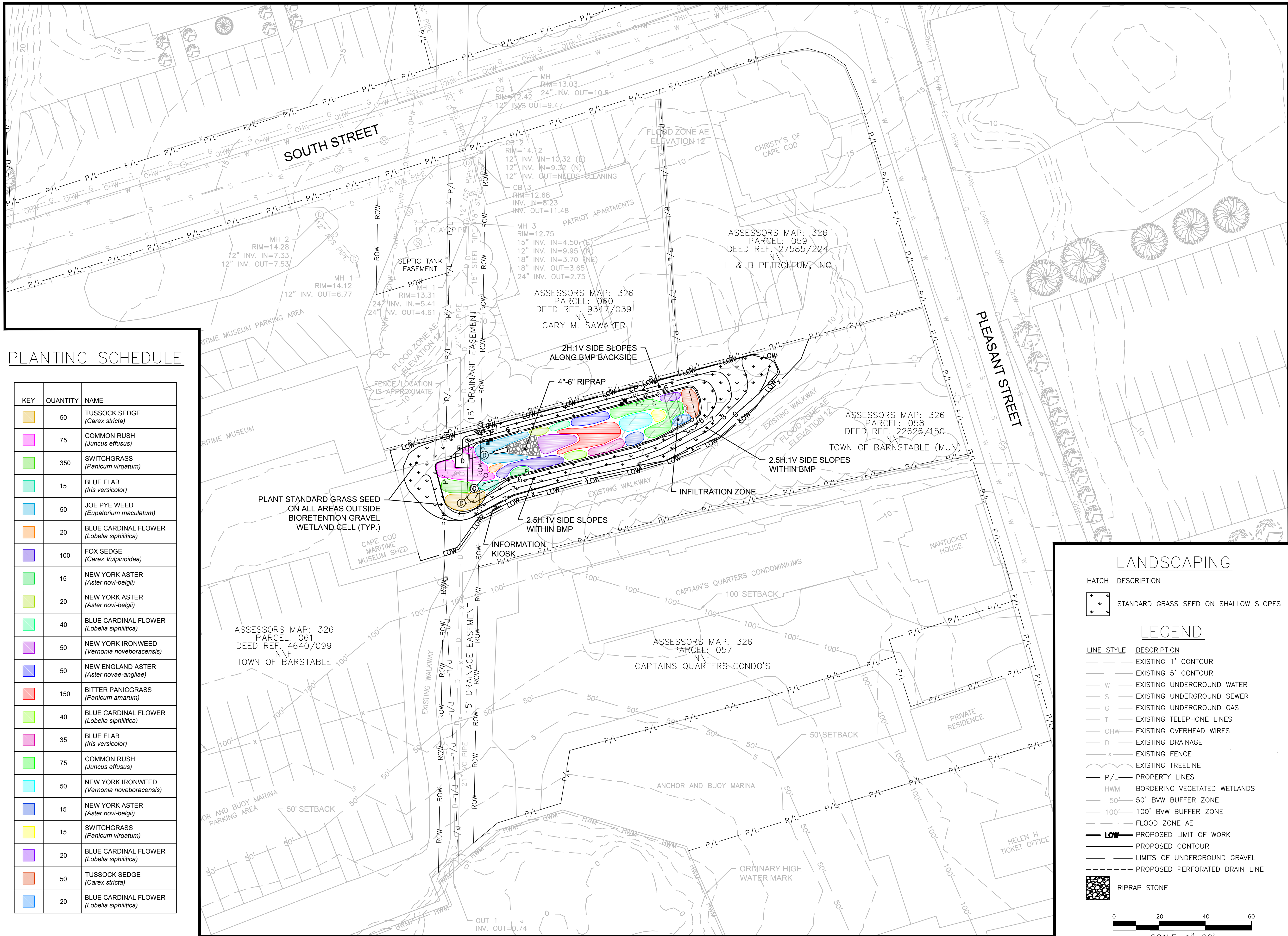
21 DEPOT STREET
MERRIMACK, NH 03054

EPA Green Infrastructure
Education and Outreach Project

GATEWAY MARINA BMP,
GRAVEL BIORETENTION CELL

South Street and Pleasant
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| Project No.: 677-2 Date: NOVEMBER 2015 Drawn By: NC Checked By: ML Horizontal Datum: NAD88 Vertical Datum: NAVD88 | Sheet C-3 |
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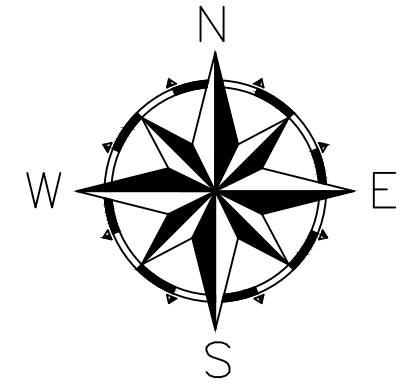
PLANTING SCHEDULE

| KEY | QUANTITY | NAME |
|-----|----------|---|
| | 50 | TUSSECK SEDGE (<i>Carex stricta</i>) |
| | 75 | COMMON RUSH (<i>Juncus effusus</i>) |
| | 350 | SWITCHGRASS (<i>Panicum virgatum</i>) |
| | 15 | BLUE FLAB (<i>Iris versicolor</i>) |
| | 50 | JOE PYE WEED (<i>Eupatorium maculatum</i>) |
| | 20 | BLUE CARDINAL FLOWER (<i>Lobelia siphilitica</i>) |
| | 100 | FOX SEDGE (<i>Carex Vulpinoidea</i>) |
| | 15 | NEW YORK ASTER (<i>Aster novi-belgii</i>) |
| | 20 | NEW YORK ASTER (<i>Aster novi-belgii</i>) |
| | 40 | BLUE CARDINAL FLOWER (<i>Lobelia siphilitica</i>) |
| | 50 | NEW YORK IRONWEED (<i>Vernonia noveboracensis</i>) |
| | 50 | NEW ENGLAND ASTER (<i>Aster novae-angliae</i>) |
| | 150 | BITTER PANICGRASS (<i>Panicum amarum</i>) |
| | 40 | BLUE CARDINAL FLOWER (<i>Lobelia siphilitica</i>) |
| | 35 | BLUE FLAB (<i>Iris versicolor</i>) |
| | 75 | COMMON RUSH (<i>Juncus effusus</i>) |
| | 50 | NEW YORK IRONWEED (<i>Vernonia noveboracensis</i>) |
| | 15 | NEW YORK ASTER (<i>Aster novi-belgii</i>) |
| | 15 | SWITCHGRASS (<i>Panicum virgatum</i>) |
| | 20 | BLUE CARDINAL FLOWER (<i>Lobelia siphilitica</i>) |
| | 50 | TUSSECK SEDGE (<i>Carex stricta</i>) |
| | 20 | BLUE CARDINAL FLOWER (<i>Lobelia siphilitica</i>) |

GATEWAY MARINA BMP, BARNSTABLE – LANDSCAPING AND SURFACE TREATMENTS

General Notes

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| | | |
|-----|------------------------|-------|
| 5 | As-Built | 11/15 |
| 4 | 100% Design for Const. | 04/15 |
| 3 | 90% Design | 03/15 |
| 2 | 60% Design | 02/15 |
| 1 | Conceptual | 01/15 |
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GRAVEL BIORETENTION CELL

South Street and Pleasant
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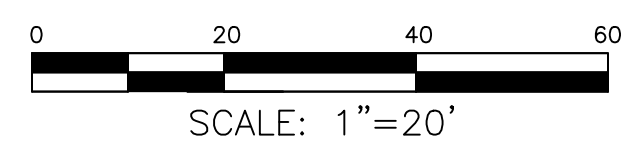
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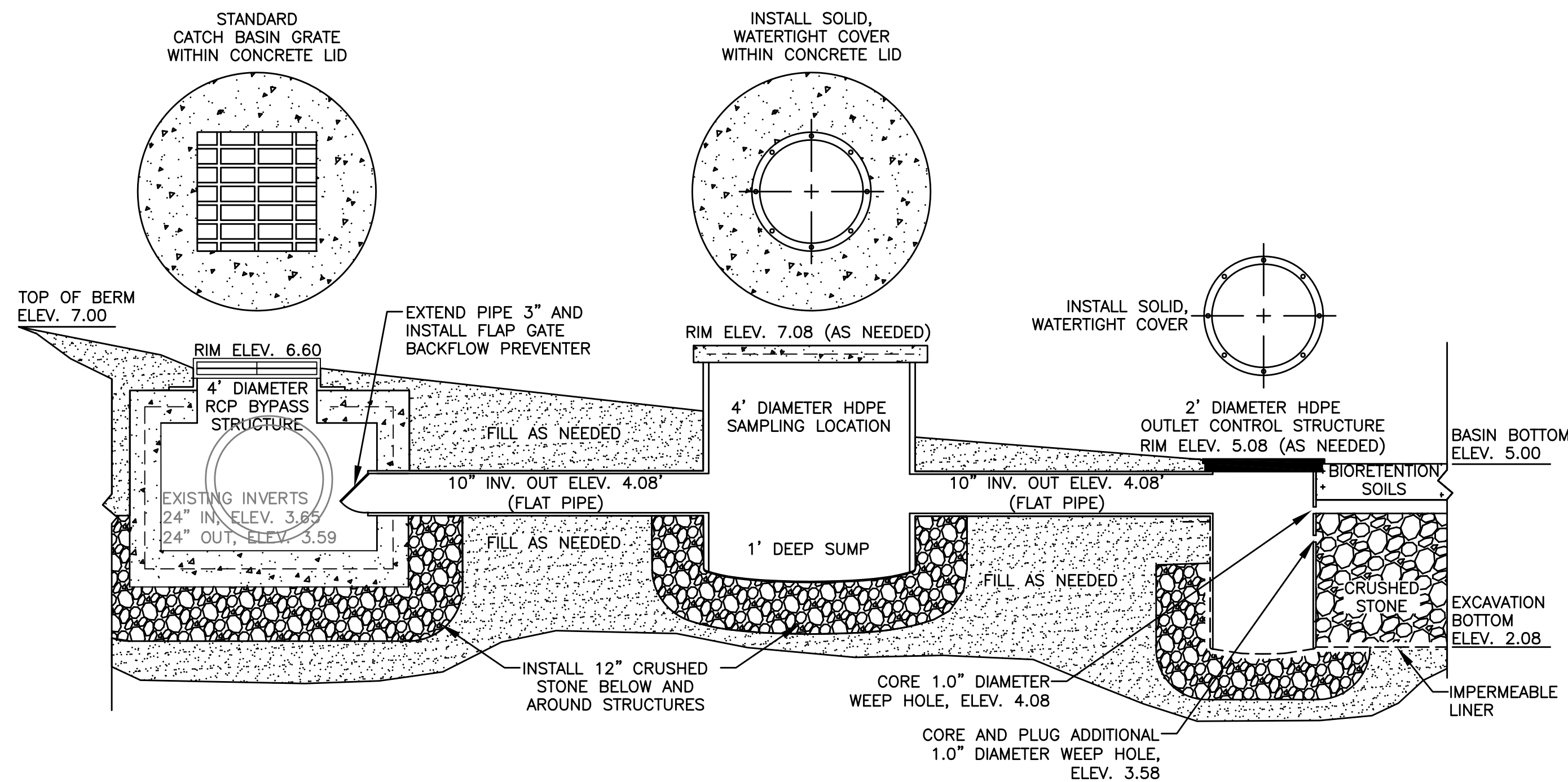
LANDSCAPING

| HATCH | DESCRIPTION |
|-------|---------------------------------------|
| | STANDARD GRASS SEED ON SHALLOW SLOPES |

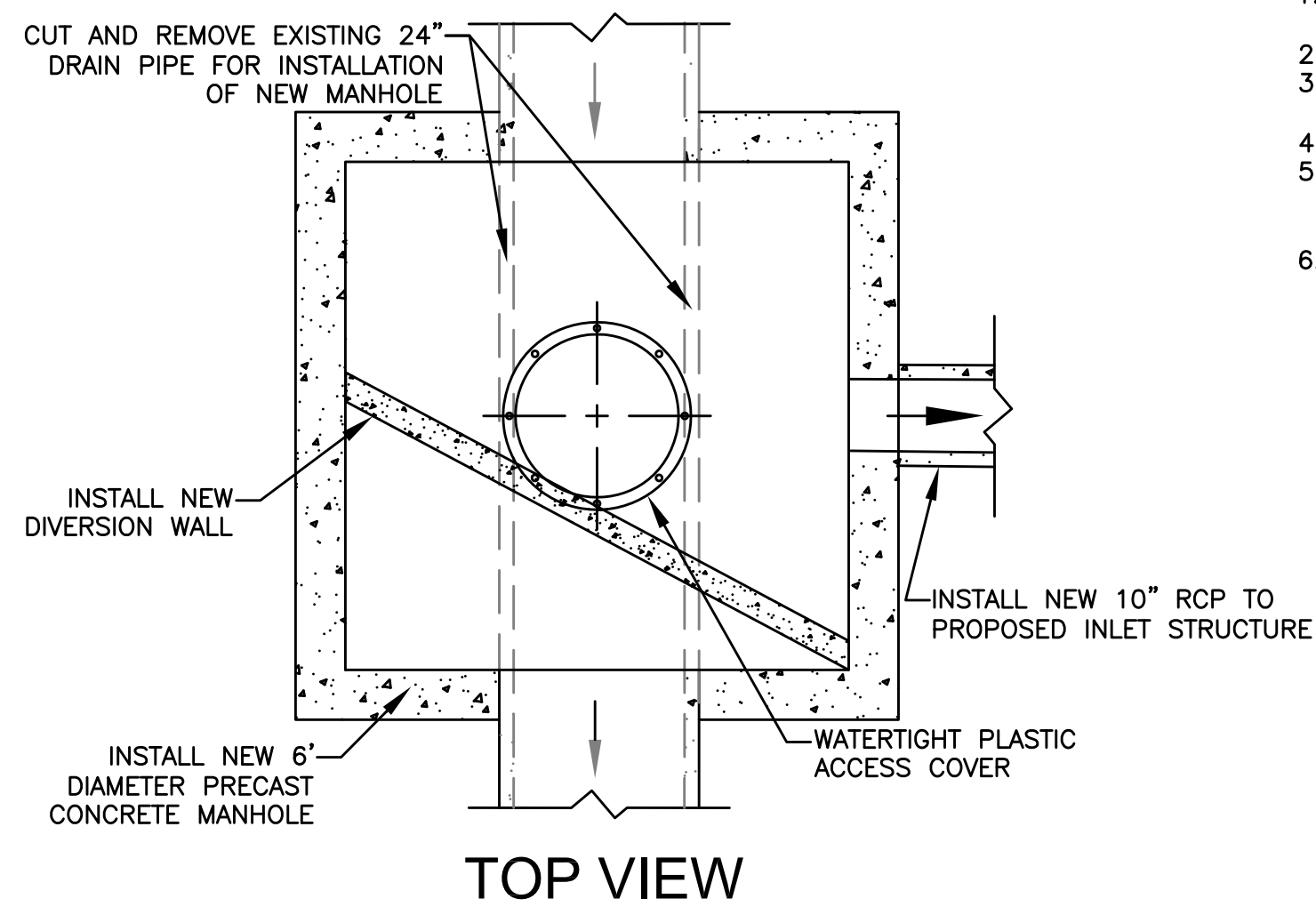
LEGEND

| LINE STYLE | DESCRIPTION |
|------------|--------------------------------|
| | EXISTING 1' CONTOUR |
| | EXISTING 5' CONTOUR |
| | EXISTING UNDERGROUND WATER |
| | EXISTING UNDERGROUND SEWER |
| | EXISTING UNDERGROUND GAS |
| | EXISTING TELEPHONE LINES |
| | EXISTING OVERHEAD WIRES |
| | EXISTING DRAINAGE |
| | EXISTING FENCE |
| | EXISTING TREELINE |
| | PROPERTY LINES |
| | BORDERING VEGETATED WETLANDS |
| | 50' BWV BUFFER ZONE |
| | 100' BWV BUFFER ZONE |
| | FLOOD ZONE AE |
| | PROPOSED LIMIT OF WORK |
| | PROPOSED CONTOUR |
| | LIMITS OF UNDERGROUND GRAVEL |
| | PROPOSED PERFORATED DRAIN LINE |
| | RIPRAP STONE |

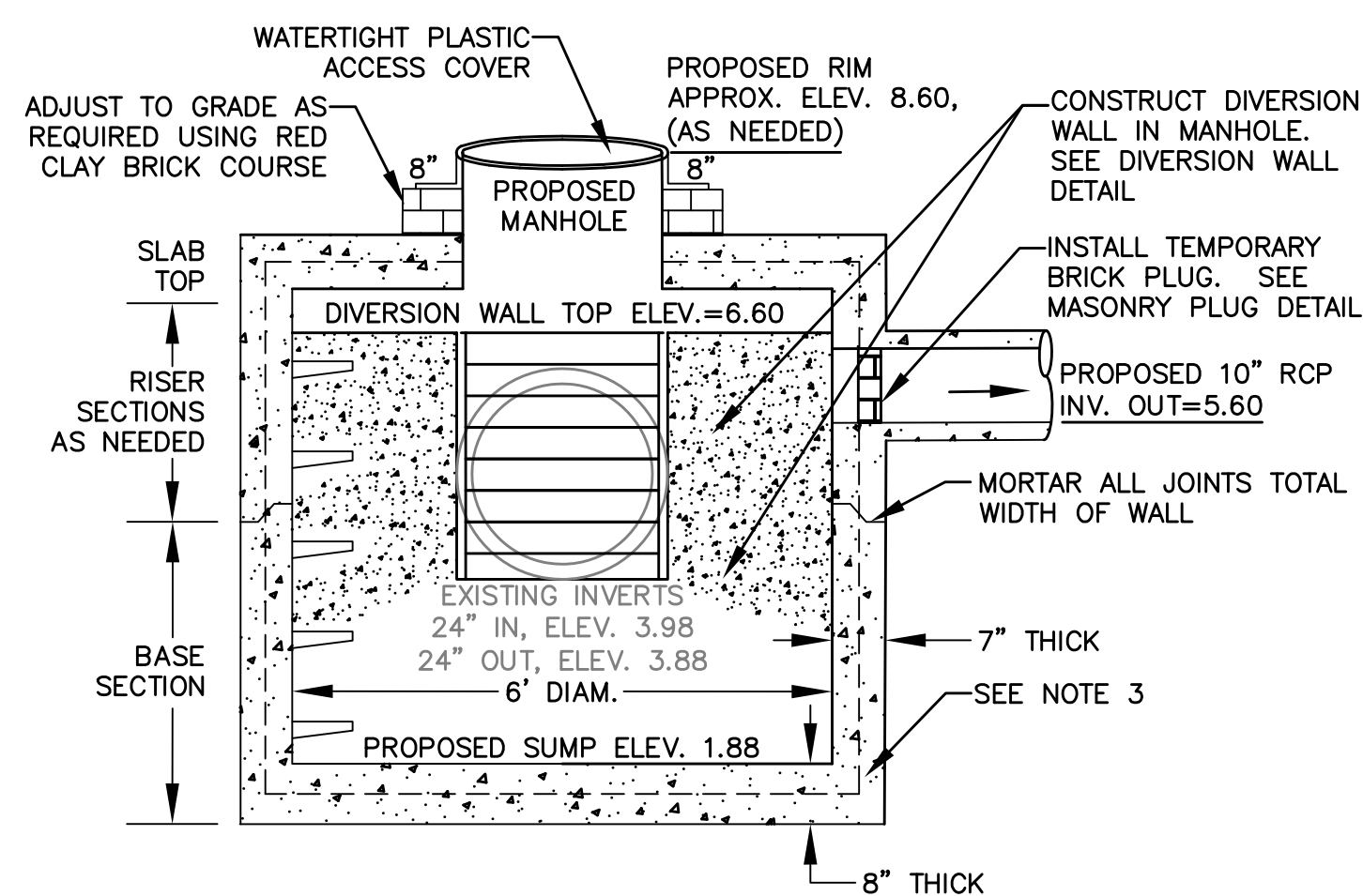




BMP OVERFLOW DETAILS



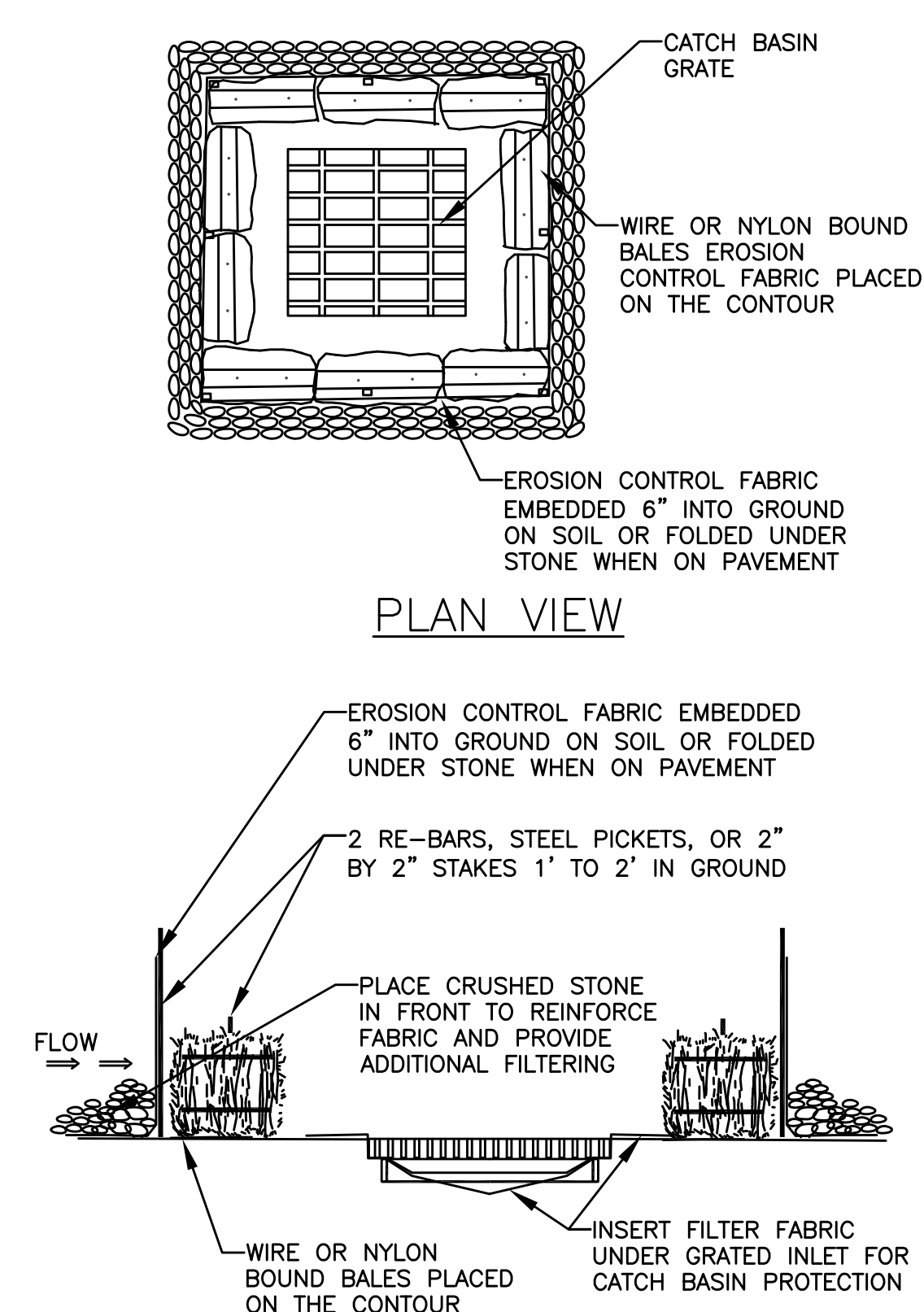
TOP VIEW



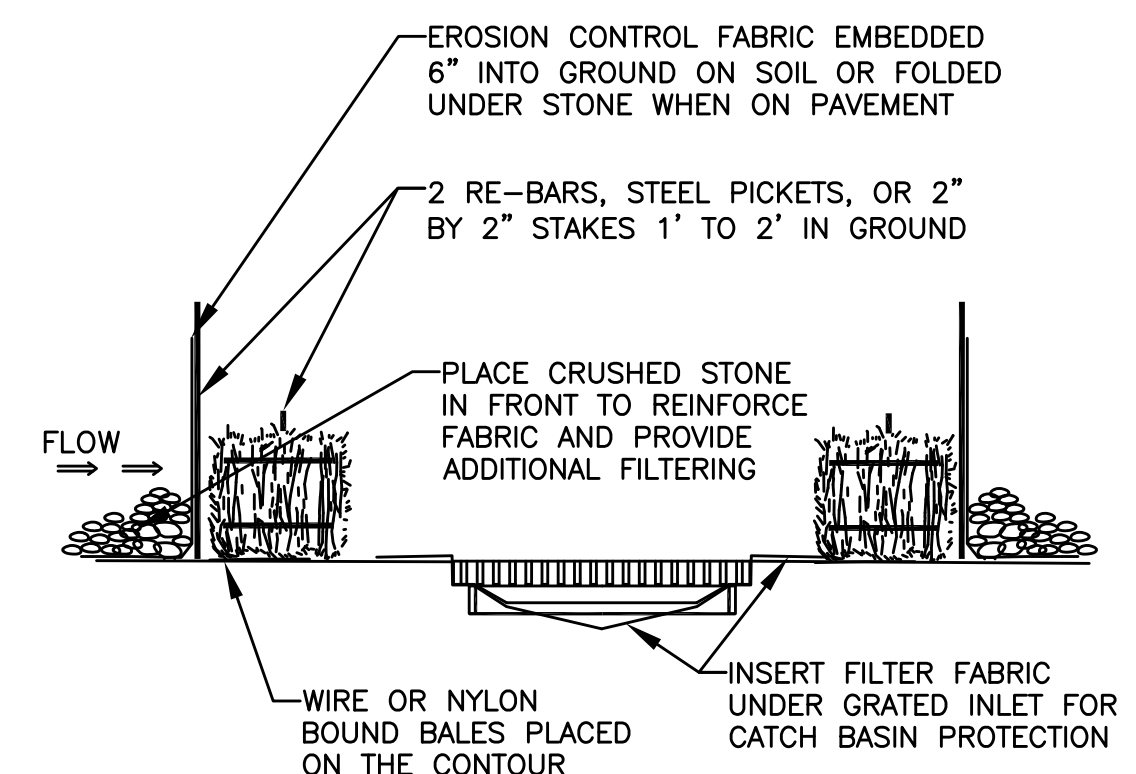
ELEVATION VIEW

RCP INLET CONTROL STRUCTURE

- NOTES
1. MANHOLE SHALL BE IN ACCORDANCE WITH SECTION 702 OF THE MA STANDARD SPECIFICATIONS
 2. CIRCUMFERENTIAL STEEL REINFORCEMENT REQUIRED = 0.15 SQ. IN./LF. MINIMUM
 3. STEEL REINFORCEMENT FOR BASE SECTION BOTTOM SHALL BE A MINIMUM OF 0.12 SQ. IN./LF. (BOTH WAYS)
 4. ONE POUR MONOLITHIC BASE SECTION.
 5. ANY NECESSARY ADJUSTMENTS DURING CONSTRUCTION WILL BE DONE BY SAW-CUTTING AND/OR CORING ONLY. NO JACKHAMMERS, HAMMERS AND CHISELS OR PNEUMATIC TOOLS WILL BE ALLOWED
 6. STEPS SHALL CONFORM TO STD. 5.3.0 AND SHALL BE INSTALLED AT THE CASTING PLANT



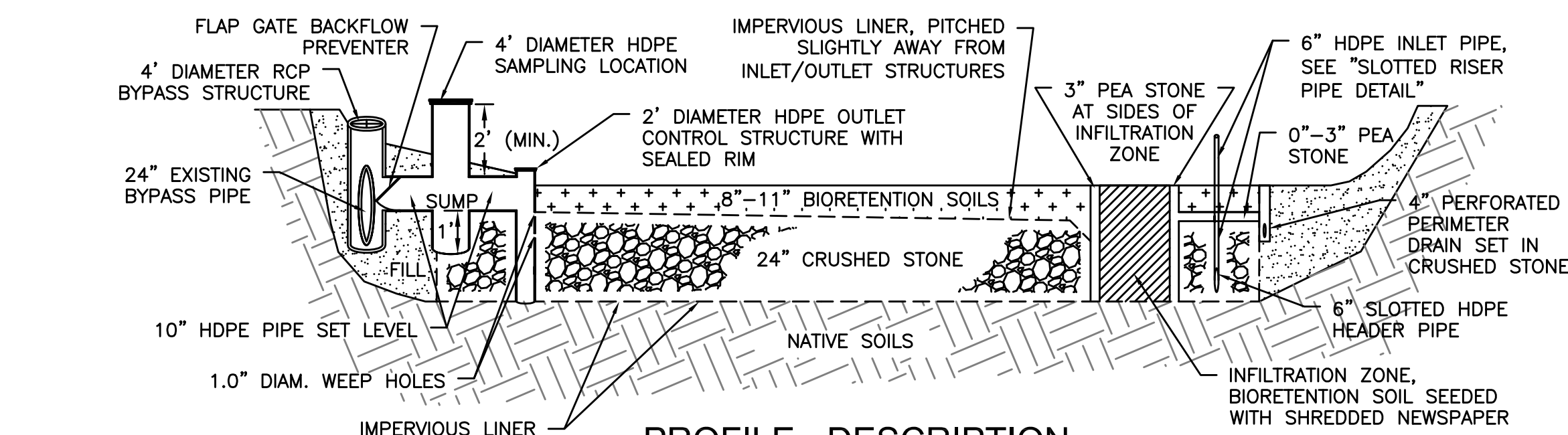
PLAN VIEW



PROFILE VIEW

- NOTES
1. SILT FENCE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 6"
 2. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED

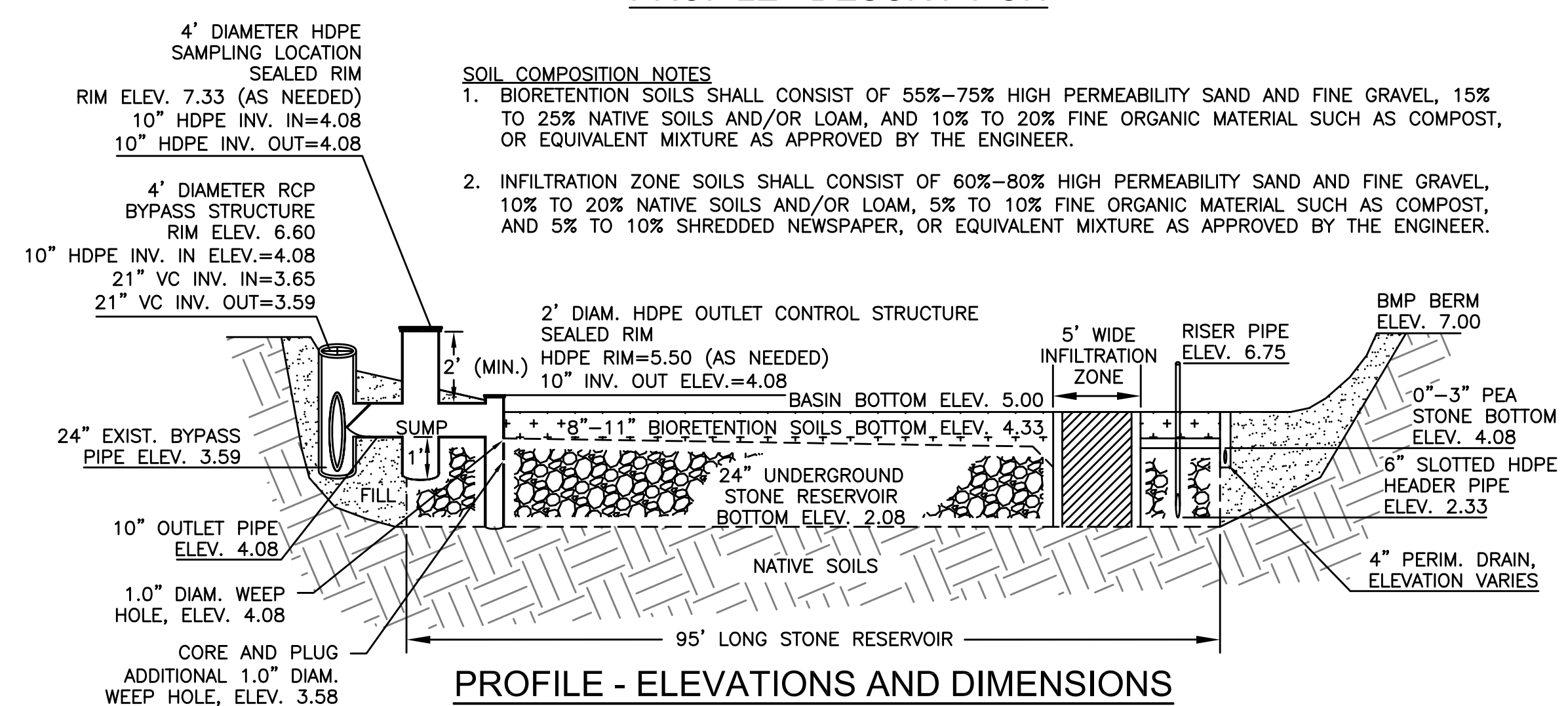
CATCH BASIN EROSION CONTROL



PROFILE - DESCRIPTION

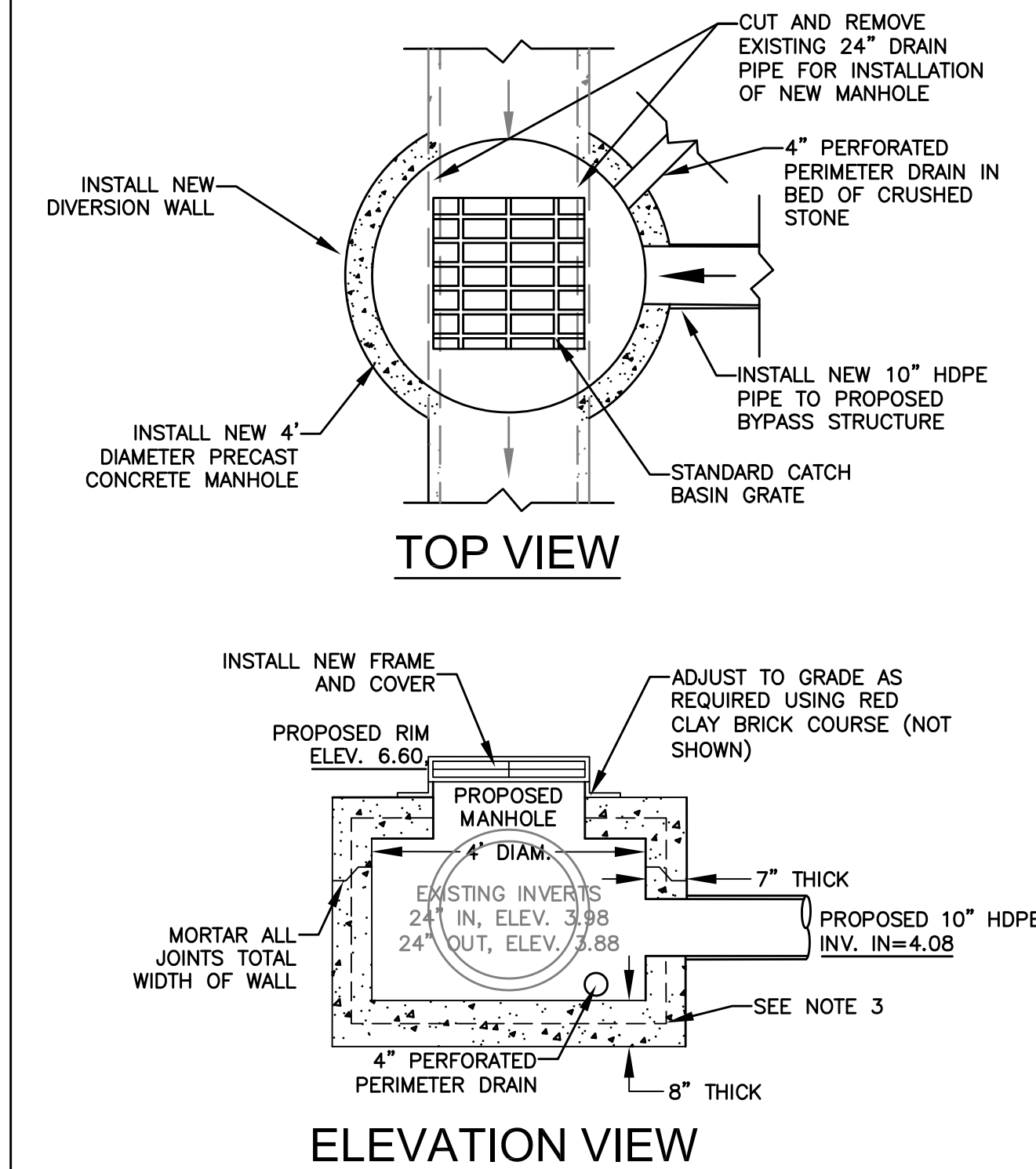
SOIL COMPOSITION NOTES

1. BIORETENTION SOILS SHALL CONSIST OF 55%-75% HIGH PERMEABILITY SAND AND FINE GRAVEL, 15% TO 25% NATIVE SOILS AND/OR LOAM, AND 10% TO 20% FINE ORGANIC MATERIAL SUCH AS COMPOST, OR EQUIVALENT MIXTURE AS APPROVED BY THE ENGINEER.
2. INFILTRATION ZONE SOILS SHALL CONSIST OF 60%-80% HIGH PERMEABILITY SAND AND FINE GRAVEL, 10% TO 20% NATIVE SOILS AND/OR LOAM, 5% TO 10% FINE ORGANIC MATERIAL SUCH AS COMPOST, AND 5% TO 10% SHREDDED NEWSPAPER, OR EQUIVALENT MIXTURE AS APPROVED BY THE ENGINEER.

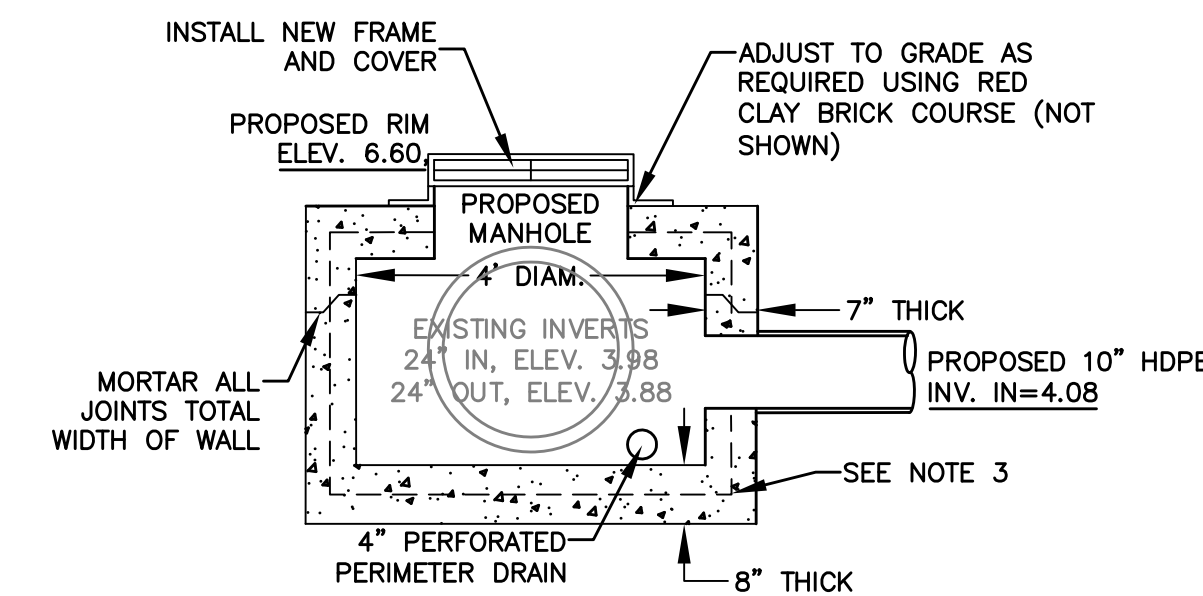


PROFILE - ELEVATIONS AND DIMENSIONS

STORMWATER BMP DETAILS

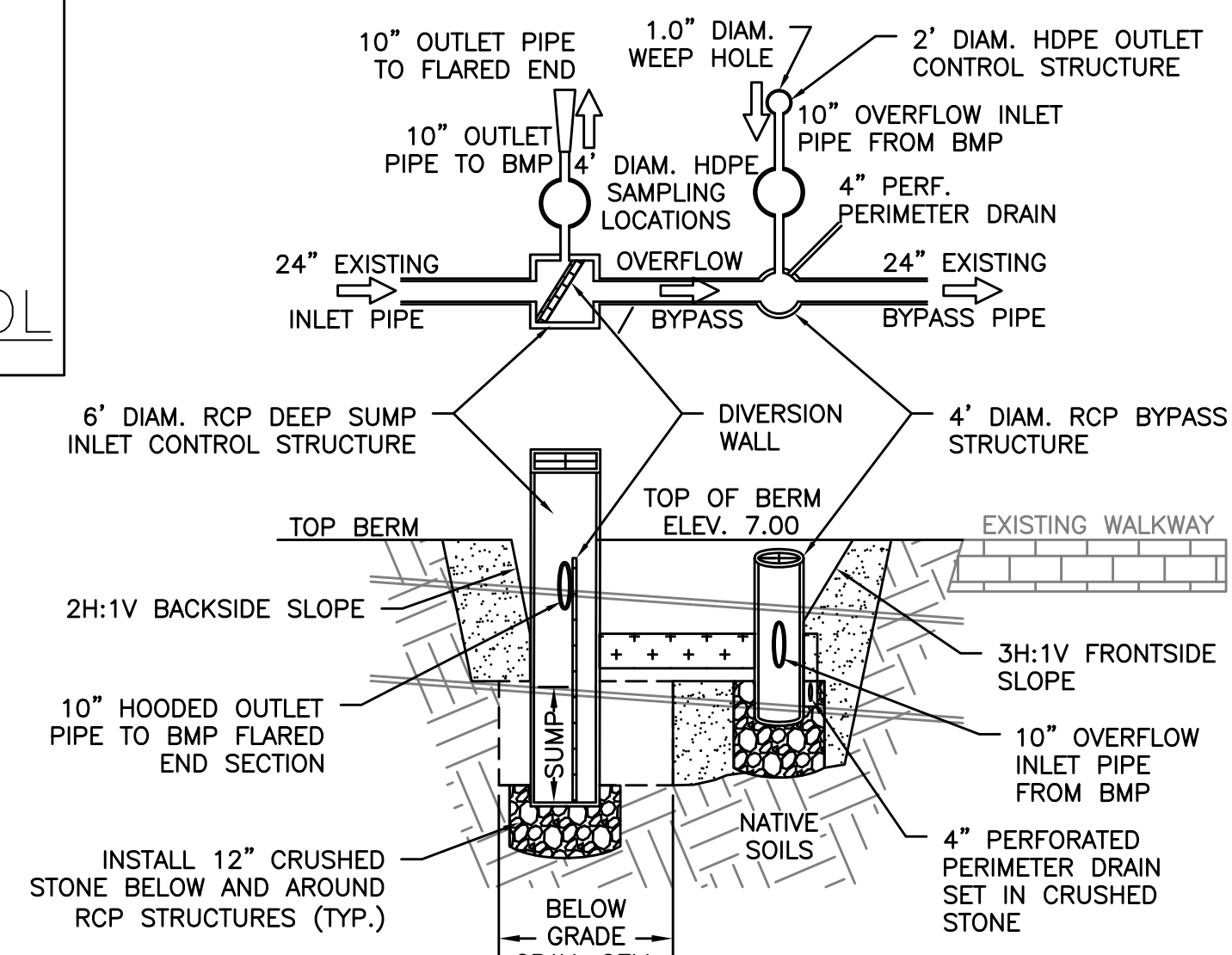


TOP VIEW

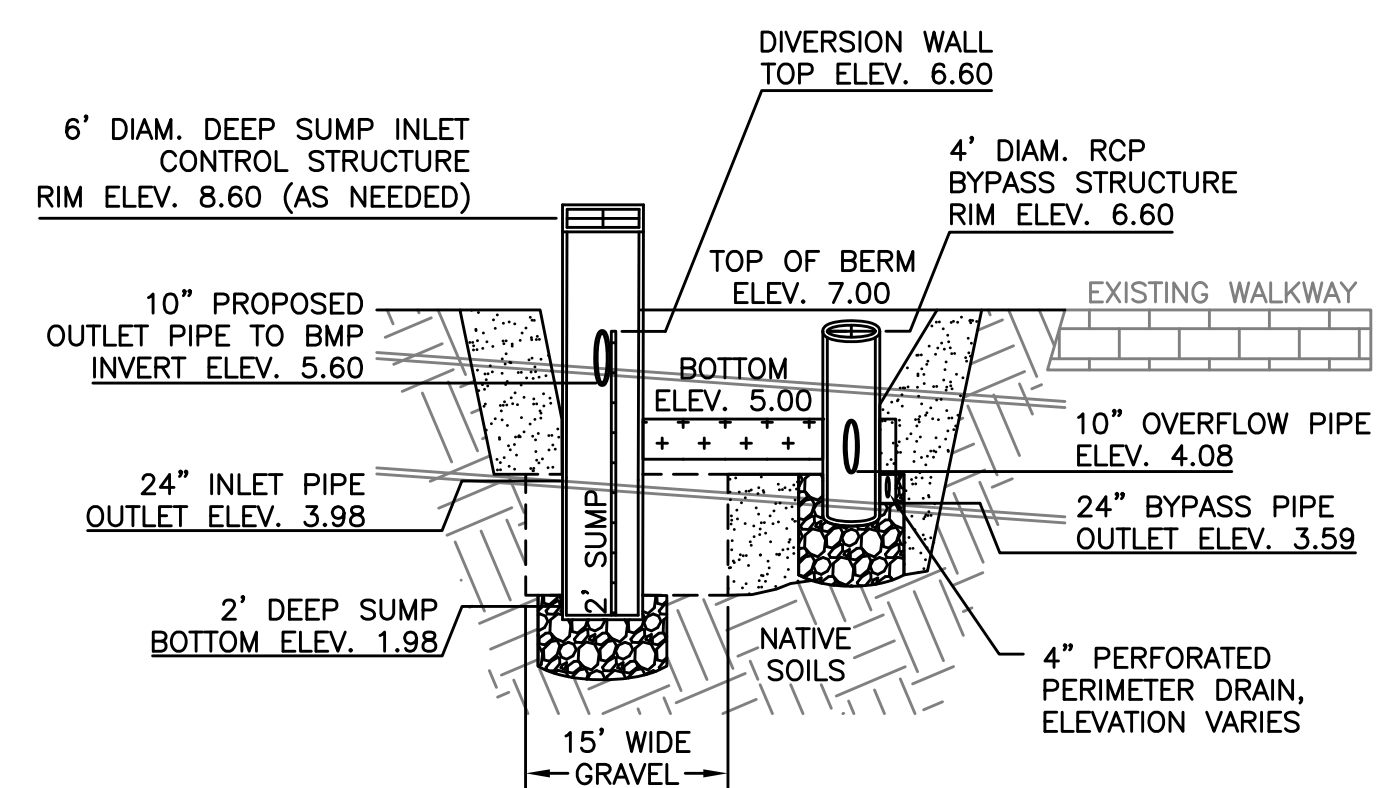


ELEVATION VIEW

RCP BYPASS STRUCTURE



CROSS-SECTION A-A - DESCRIPTION



CROSS-SECTION A-A - ELEVATIONS AND DIMENSIONS

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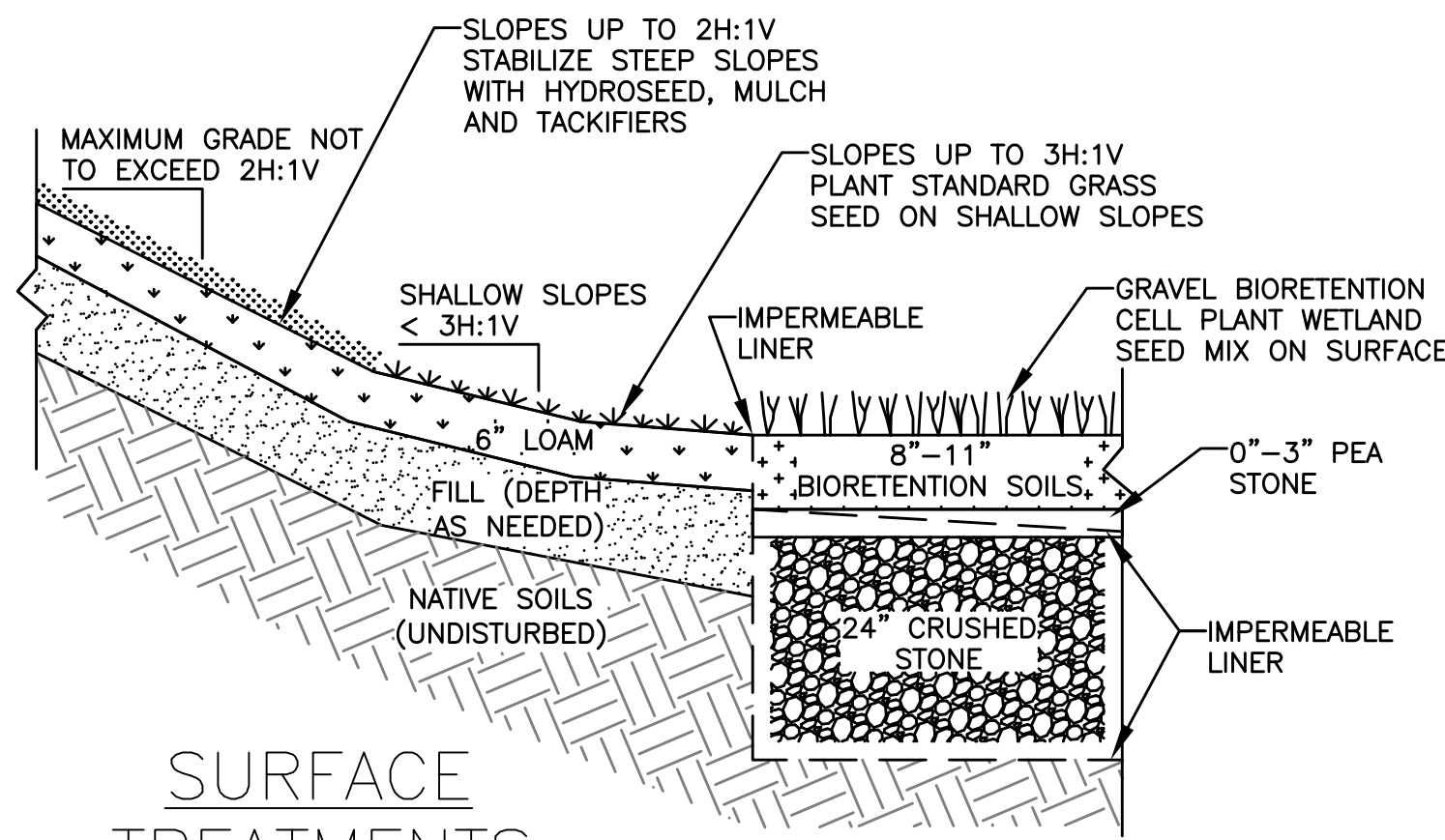
EPA Green Infrastructure
Education and Outreach Project

GATEWAY MARINA BMP,
GRAVEL BIORETENTION CELL

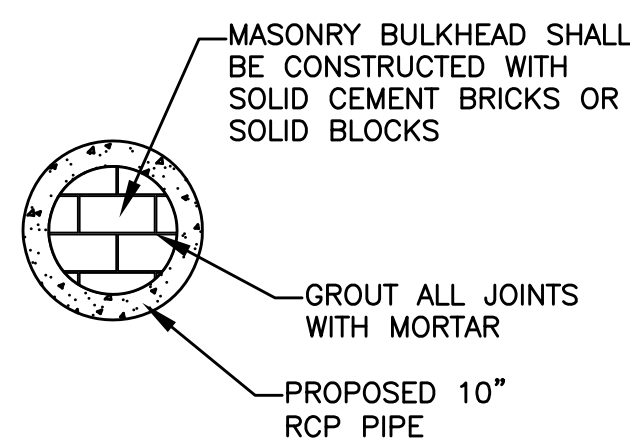
South Street and Pleasant
Street, Barnstable MA

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Date: NOVEMBER 2015
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Vertical Datum: NAVD88

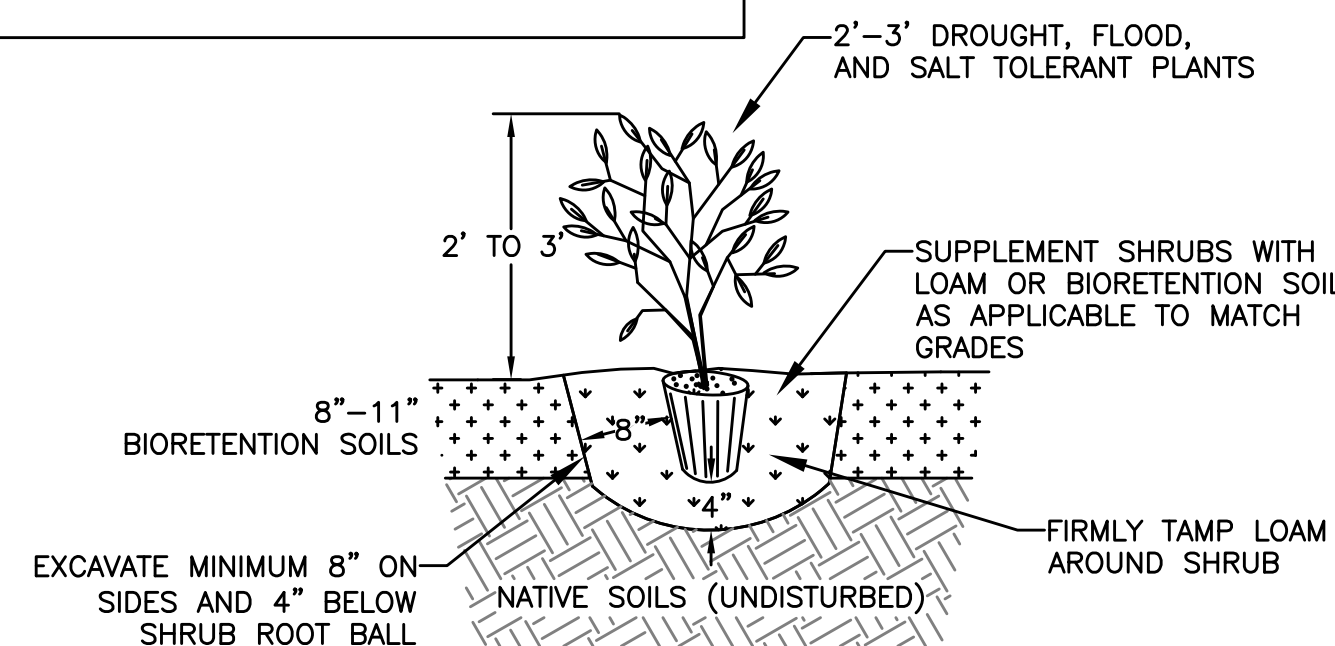
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C-5



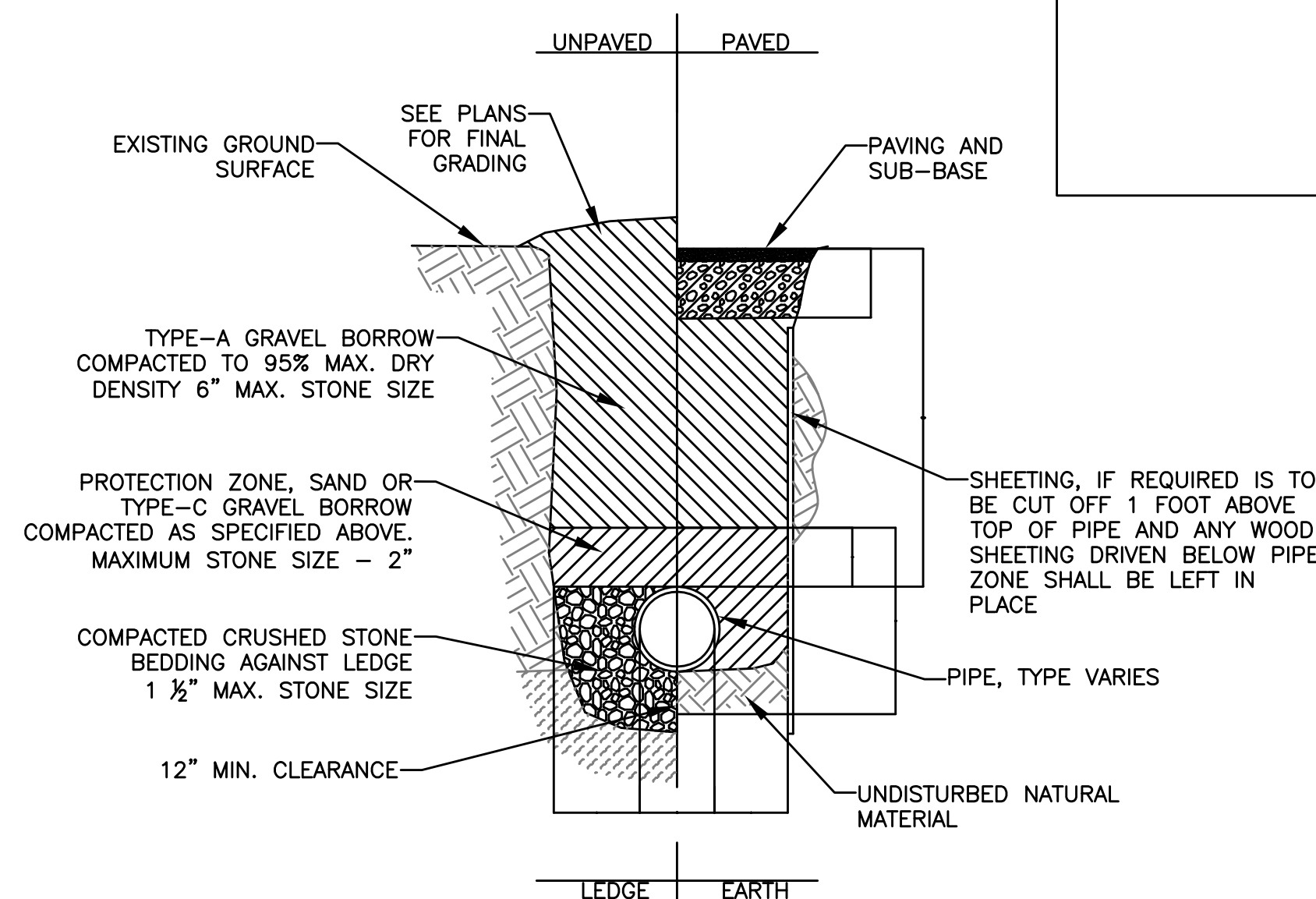
SURFACE TREATMENTS



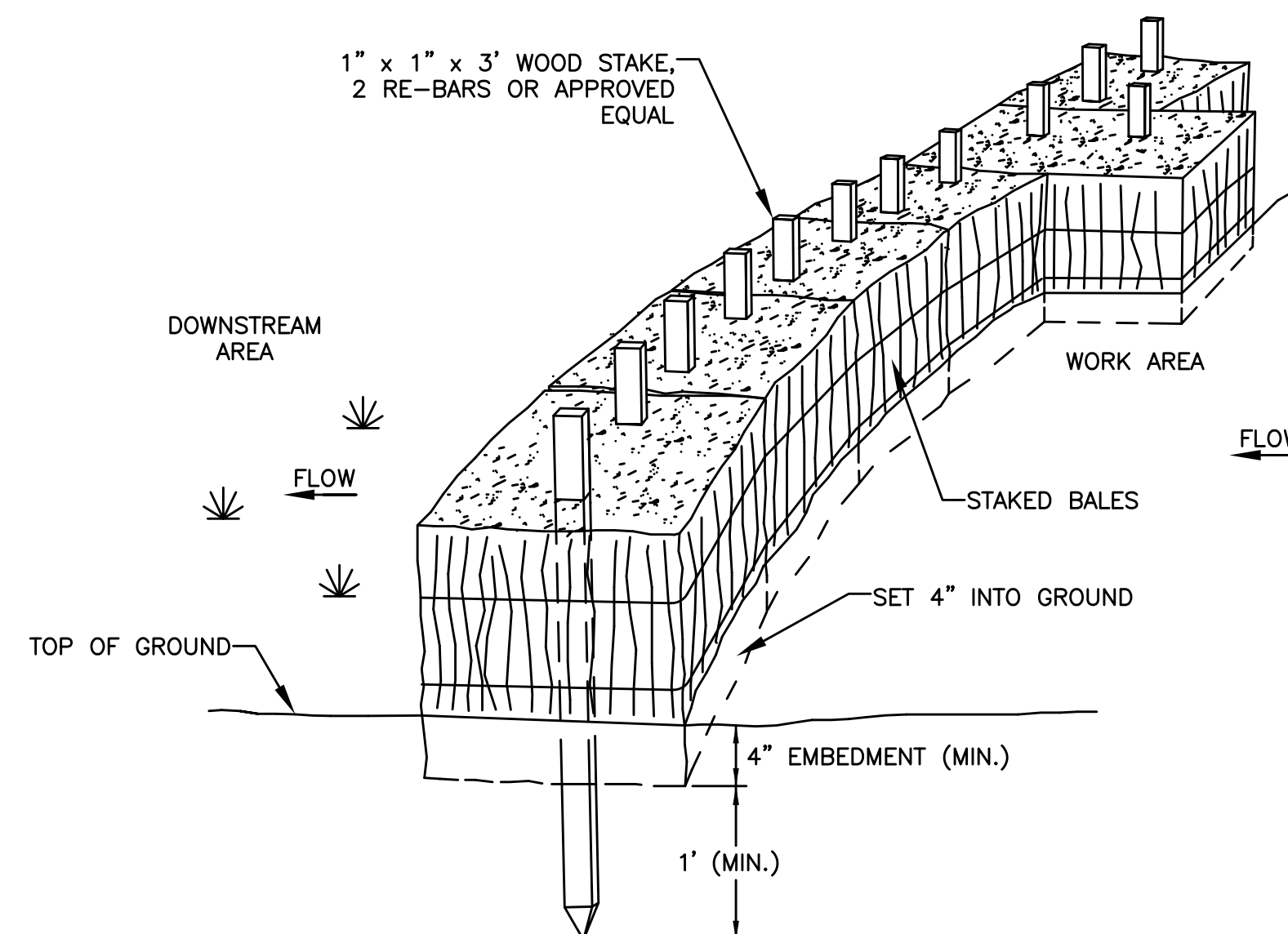
TEMPORARY PLUG



PLANTING DETAIL

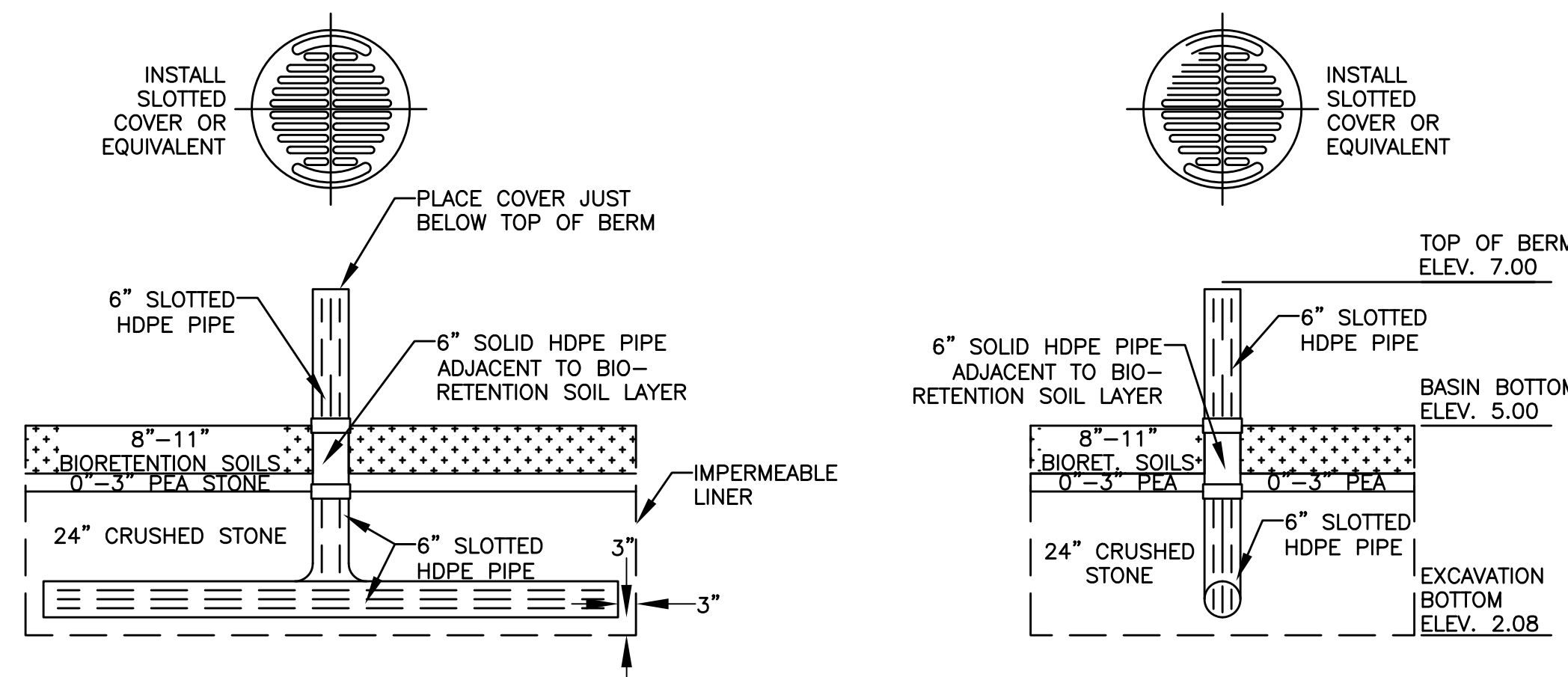


PIPE TRENCHING DETAIL



- NOTES
1. PUT ONE HAYBALE PERPENDICULAR ALONG HAYBALE BARRIER (100' O.C.)

PERIMETER EROSION CONTROLS

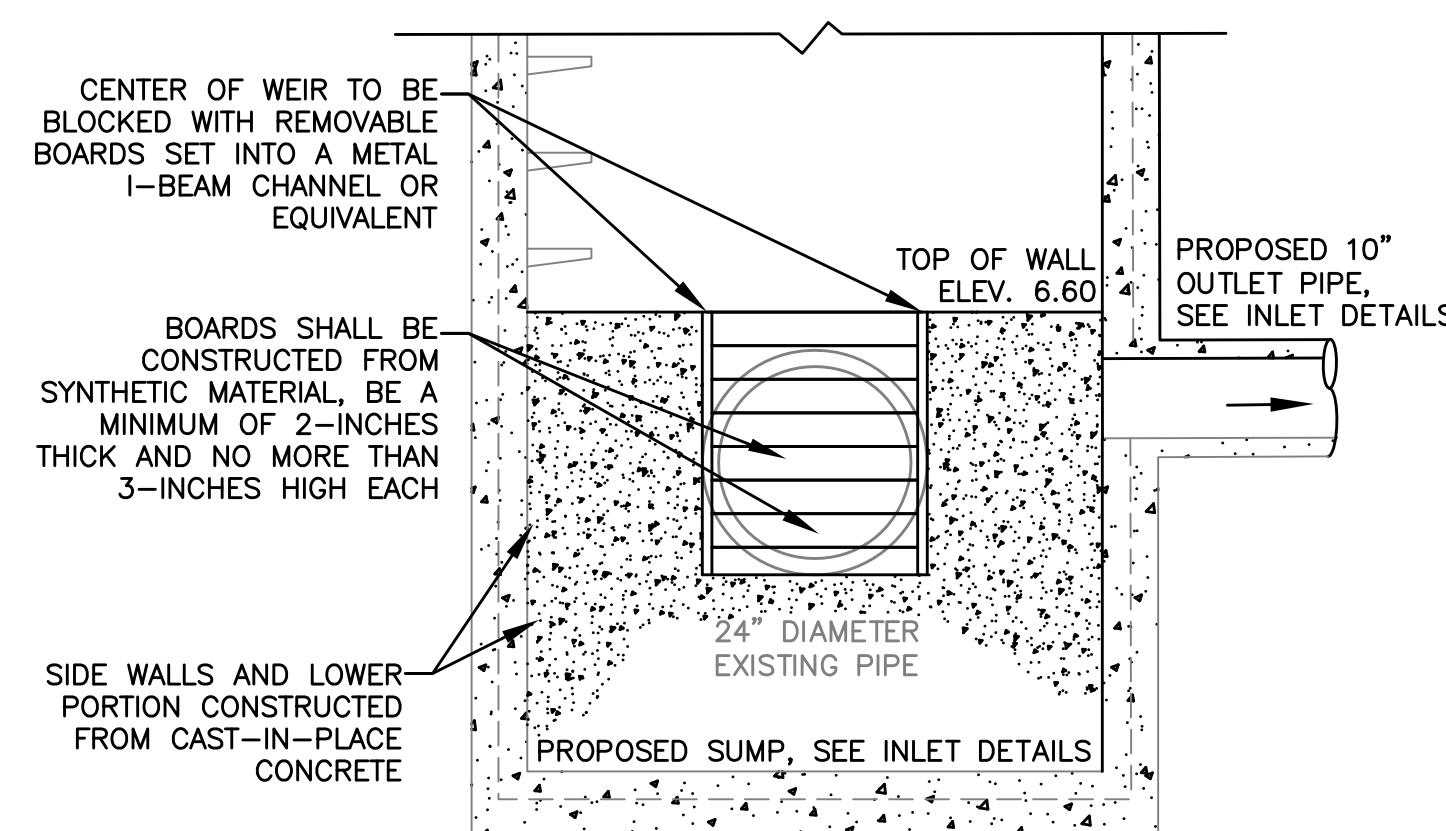


CROSS-SECTION VIEW

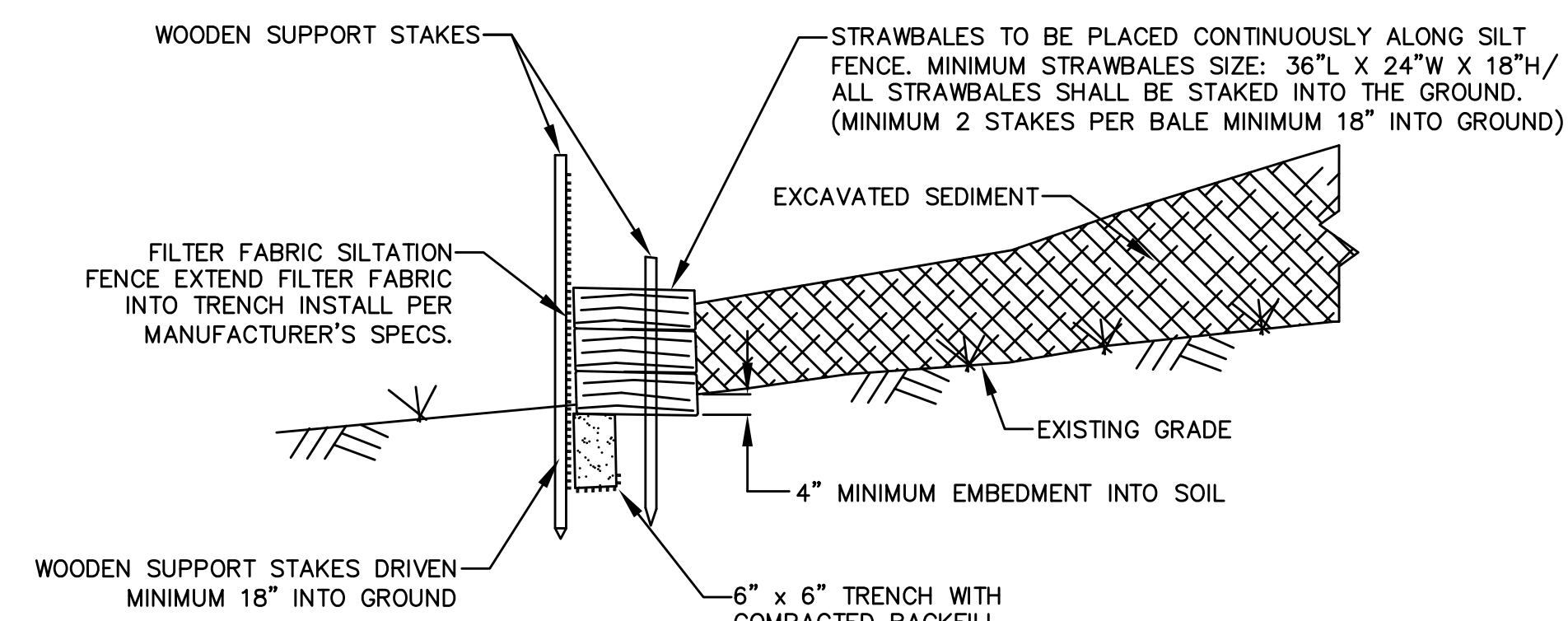
ELEVATION VIEW

- SLOTTED PIPE SPECIFICATIONS
1. SLOTS SHALL BE A MINIMUM OF 0.040 INCHES WIDE SPACED EVERY 0.25\"/>

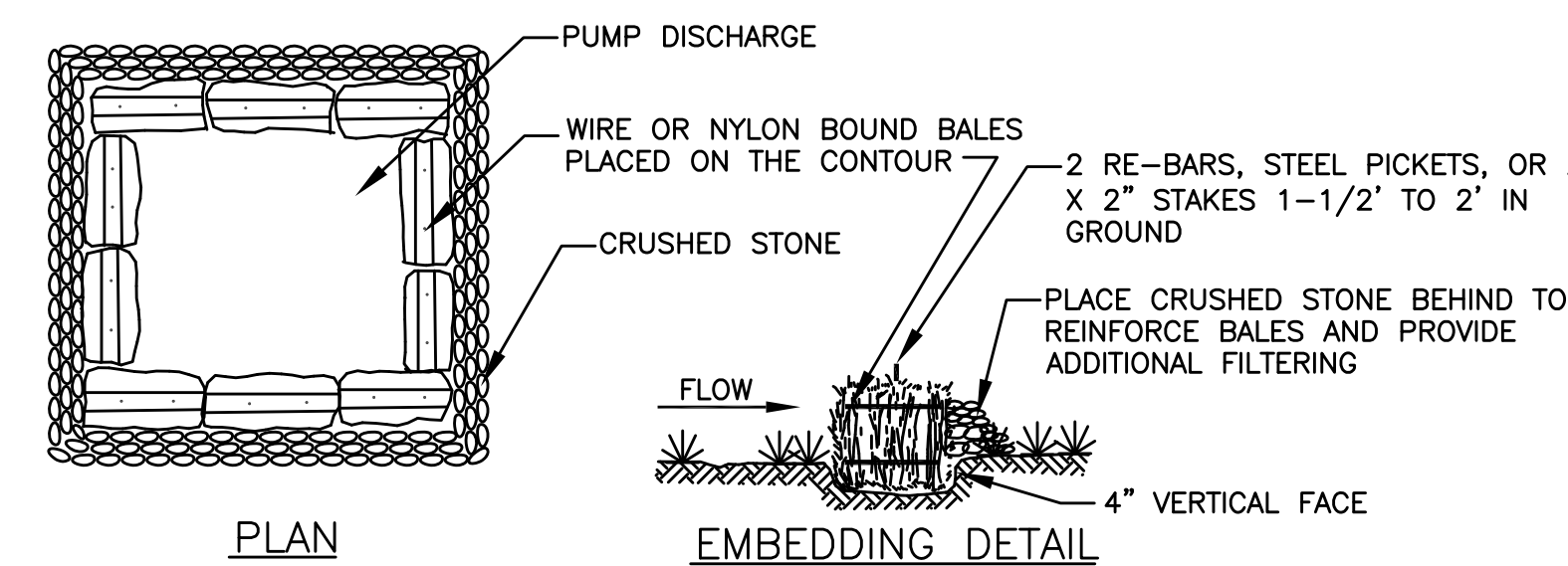
SLOTTED RISER PIPE DETAIL



DIVERSION WALL



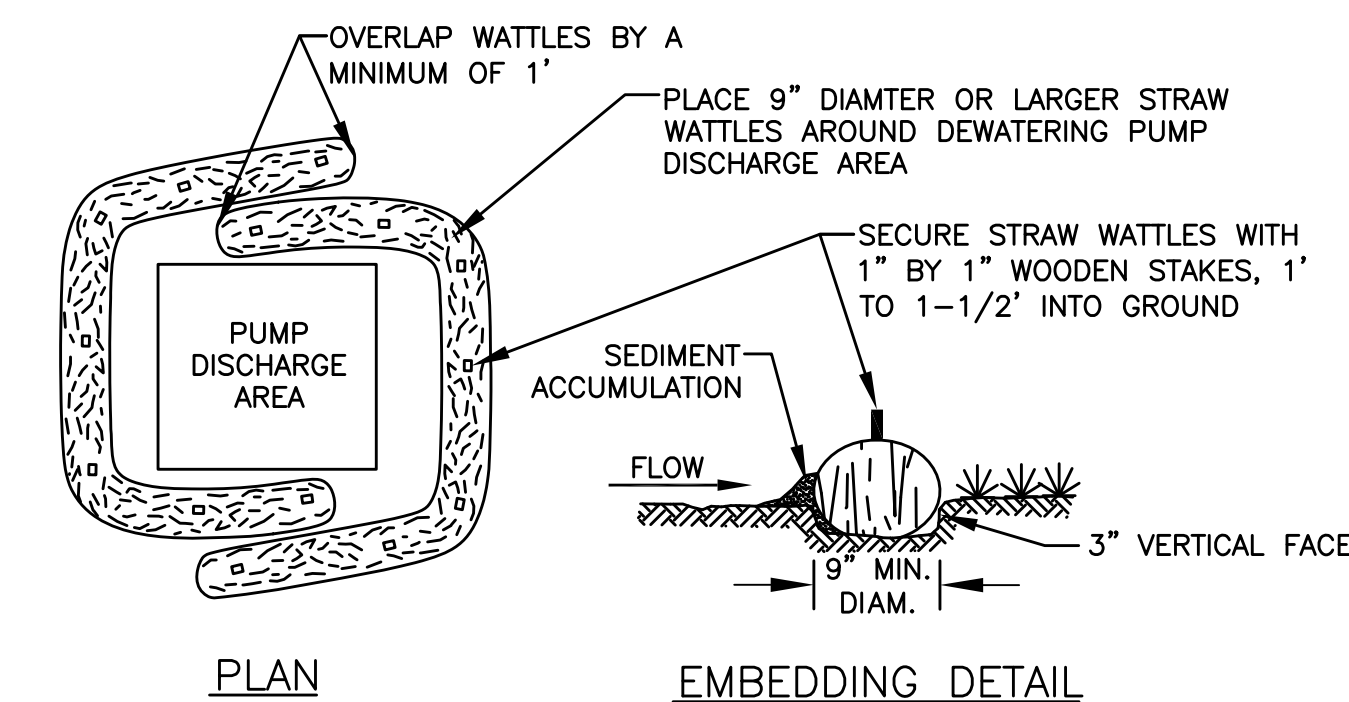
MATERIAL DE-WATERING AREA



STRAW BALE BARRIER CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY BUTTED.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4\"/>

PUMPING DE-WATERING DISCHARGE AREA, HAY BALES



STRAW WATTLE DE-WATERING AREA CONSTRUCTION SPECIFICATIONS

1. WATTLES SHALL BE PLACED IN A ROW WITH ENDS OVERLAPPING A MINIMUM OF 1\"/>

PUMPING DE-WATERING DISCHARGE AREA, STRAW WATTLES

General Notes

1. THE LOCATION OF UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED OR INSPECTED. THE CONTRACTOR, PRIOR TO COMMENCEMENT OF CONSTRUCTION, SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT "DIG-SAFE" AT 1-888-344-7233.
2. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION TO PREVENT ANY DAMAGE TO ADJACENT PROPERTIES. ALL AREAS WHICH ARE AFFECTED BY THE CONTRACTOR'S OPERATIONS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION OR BETTER, AT NO ADDITIONAL COST TO THE OWNER.
3. ANY CHANGE IN FIELD CONDITIONS SHALL BE REPORTED TO THE ENGINEER TO INSURE THAT ANY MODIFICATIONS TO THE ORIGINAL DESIGN ARE PROPER AND ADEQUATE TO SERVE THE PROJECT'S NEEDS AND COMPLY WITH THE APPLICABLE STANDARDS AND REGULATIONS.
4. CONTRACTOR SHALL IMMEDIATELY REPAIR OR FILL ANY POTHOLES THAT OCCUR DUE TO CONSTRUCTION.
5. CONTRACTOR SHALL REPAIR ALL PAVING OR BRICKWORK ON SITE DAMAGED OR REMOVED DURING CONSTRUCTION.
6. REMOVE ALL TEMPORARY EROSION CONTROLS FROM THE SITE AT THE CONCLUSION OF CONSTRUCTION ACTIVITIES.
7. STORMWATER SHALL NOT BE DIRECTED INTO THE BASIN UNTIL ALL PLANTINGS ARE SUITABLY ESTABLISHED. CONTRACTOR SHALL EITHER TIE INTO THE EXISTING CATCH BASIN LAST OR INSTALL A REMOVAL PLUG.

| 5 | As-Builts | 11/15 |
|-----|------------------------|-------|
| 4 | 100% Design for Const. | 04/15 |
| 3 | 90% Design | 03/15 |
| 2 | 60% Design | 02/15 |
| 1 | Conceptual | 01/15 |
| No. | Revision/Issue | Date |

WaterVision, LLC
481 GREAT ROAD, SUITE 3
ACTON, MA 01720

COMPREHENSIVE ENVIRONMENTAL INCORPORATED
21 DEPOT STREET
MERRIMACK, NH 03054

EPA Green Infrastructure
Education and Outreach Project

GATEWAY MARINA BMP,
GRAVEL BIORETENTION CELL

South Street and Pleasant
Street, Barnstable MA

| | |
|-------------------------|-------|
| Project No.: 677-2 | Sheet |
| Date: NOVEMBER 2015 | |
| Drawn By: NC | |
| Checked By: ML | |
| Horizontal Datum: NAD88 | |
| Vertical Datum: NAVD88 | |

C-6